Google Summer of Code

GSOC 2025 LIGHTNING TALK

presented by Shubham Vishwakarma

scalacenter

LLM4S

Who Am I?

- Hi, I'm ***Shubham Vishwakarma*** from Mumbai, India Final-year CSE student at SPIT with a Management minor at SPJIMR
- Currently an Open Source Contributor with ***Scala Center*** (GSoC 2025)
- My journey with Scala began not in a classroom, but through ***Daniel Ciocîrlan's Rock the JVM courses***, which made me fall in love with the language.
- That curiosity led me to the ***Scala community*** Welcoming, supportive, and always pushing me to grow.

Shubham Vishwakarma

India 🇮🇳

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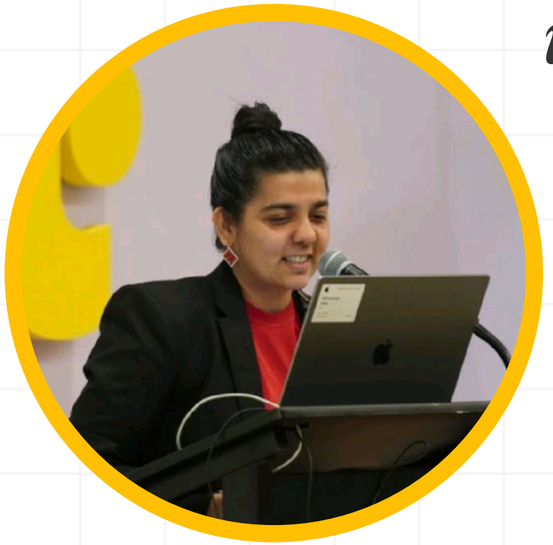
Discovering GSoC & Scala Center

- I came across ***GSoC*** with ***Scala Center*** and found the LLM4S project ; the perfect blend of Scala and AI.
- Reaching out and connecting with my mentors ***Kannupriya Kalra*** and ***Rory Graves*** made the journey real & their guidance shaped my direction.
- The challenge was clear: LLM apps are hard to ***debug***, ***observe***, and scale ***reliably***.
- Our mission set: make Scala a first-class citizen in AI tooling, rooted in ***type-safety*** and ***functional programming principles***.

Rory Graves



Kannupriya Kalra

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From First Trace to Full Demo: My Contributions

- **Tracing Support (PR #77, #119) :**

  Added execution flow tracking, spans, and timing.

  Integrated Langfuse for developer-friendly traces.

- **Type-Safe Tracing (PR #165) :**

  Rebuilt with sealed traits & composable backends.

  Ensured reliability and backward compatibility.

- **Demo & Multi-Backend (PR #184) :**

  Built a calculator agent for sequential tool-use.

  Showcased tracing with Console, Lang fuse, and NoOp.

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Why It Matters : The Impact

- **Visibility Unlocked** : Developers can now trace every LLM call
- **Type-Safe Reliability** : Sealed traits & composable backends remove fragile logging
- **Real-World Proof** : Demo agent + multi-backend tracing shows it works in practice .
- **Future-Ready** : Establishes the base for memory, multi-agent orchestration, and Scala-first AI systems.

```
============================================================
LLM COMPLETION
============================================================
Timestamp: 2025-06-19T06:44:44.454993600Z

Model: openai/gpt-4o-mini
Completion ID: gen-1750315479-FQF7Gsq9uL5iA7bAIj7x
Created: 1750315479

--- Response ---
Content: Arrr, trainin' a parrot be a fine adventure, matey! Here be some tips to help ye on yer quest:

1. **Start with Simple Words**: Begin with easy words or phrases, like "Ahoy!" or "Polly wants a cracker!" Repeat 'em oft

2. **Use Positive Reinforcement**: Reward yer feathered friend with treats or ...

--- Token Usage ---
Prompt Tokens: 64
Completion Tokens: 294
Total Tokens: 358
Estimated Cost: $0.009460 USD (approx.)
```

Image : Print Trace Example

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LLM4S Tracing Architecture — High-Level Detailed View

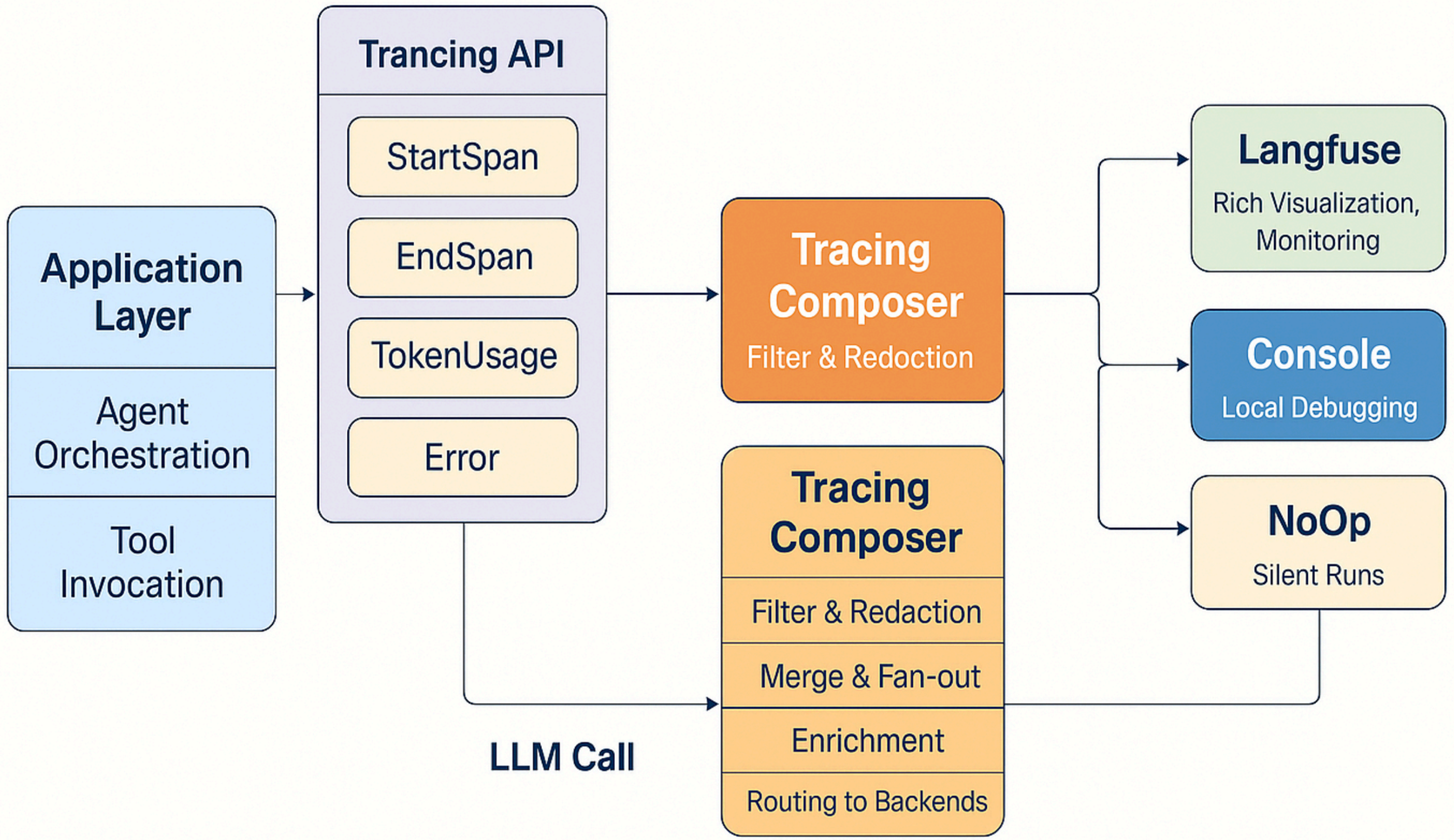

Image : LLM4S Tracing Architecture

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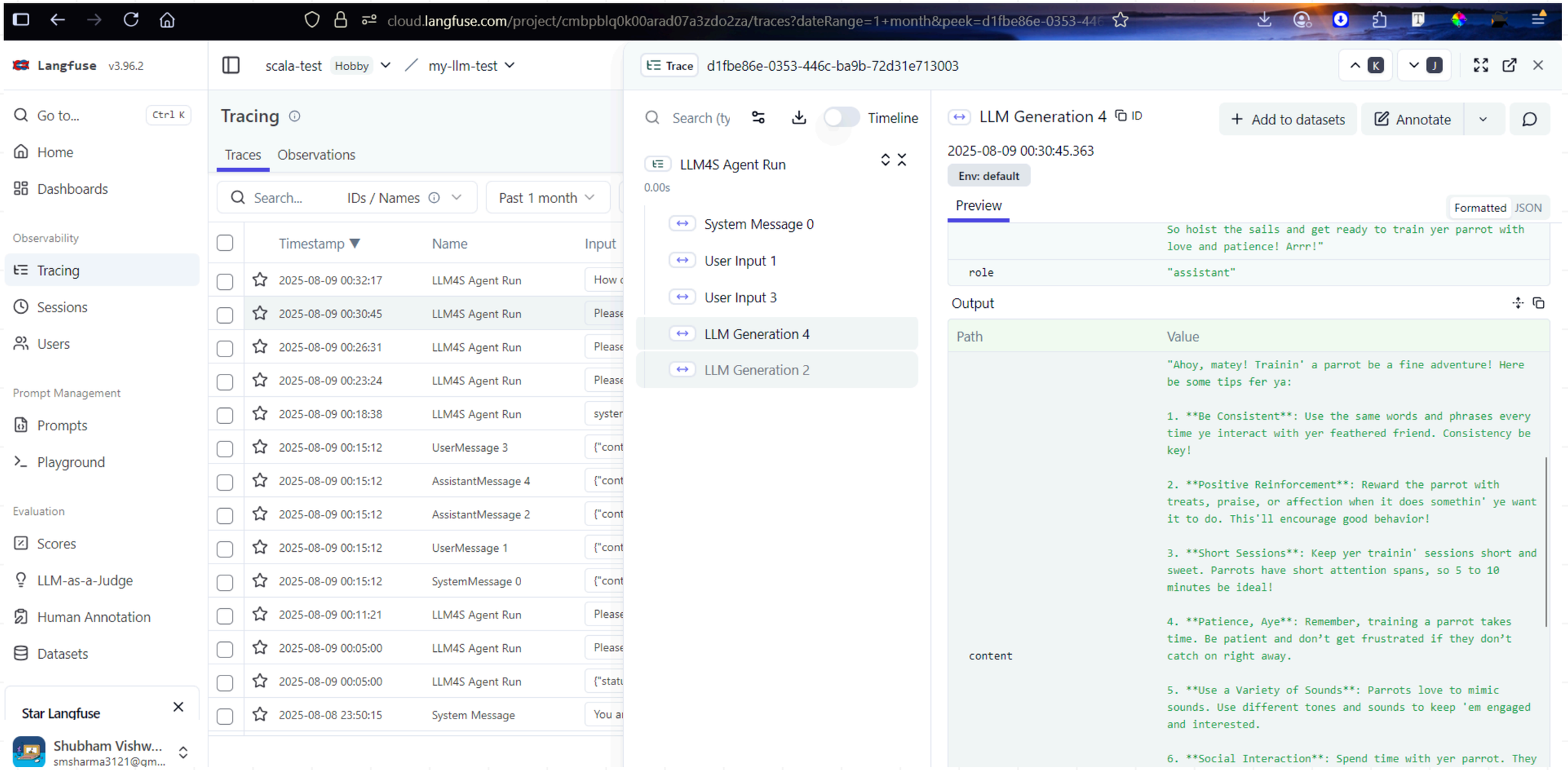

Image : Langfuse Tracing Example

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Beyond Tracing: The Next Chapter for LLM4S

- **Memory & State :**

  Hybrid memory: short-term, episodic, semantic.

  Forgetting via decay, summarization, compression.

  Backed by Redis / RocksDB / vector DB.

- **Multi-Agent Systems :**

  DAG-based planner with retries & fallbacks.

  Pub-sub signals for safe agent coordination.

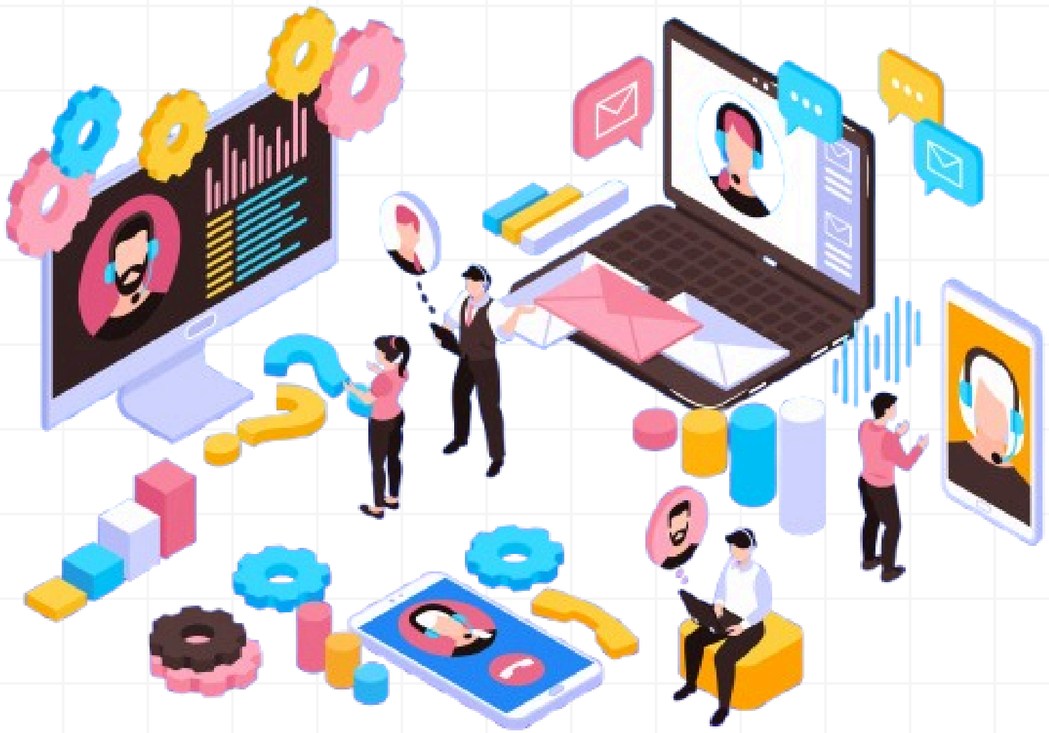
  Scala-native, type-safe orchestration.

- **Typed Prompt DSL :**

  Scala DSL for chaining LLMs, retrievers, tools.

  Cats-effect & typed streams for composability.

  Compile-time safety, no “stringly-typed” prompts.



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A Real Use Case : Meeting Minutes Generator

- **Input :** Zoom / Google Meet transcript (*raw text)*.
- **Output:**

→ Concise summary of discussion

→ Action items with owners & deadlines

→ Sentiment analysis of conversation flow

- **Why LLM4S?**

→ Streaming summaries (real-time insights as the meeting runs)

→ Guardrails via JSON schema → {*summary: String, actions: [Action]*}

→ Full traceability → every step tracked with spans/events

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THANK YOU

- From learner to contributor → grateful for this journey with Scala.
- Heartfelt thanks to my mentors Kannupriya Kalra, Rory Graves & Dmitry Mamonov, and the Scala Center.
- 💙To the Scala community for being supportive, curious, and inspiring.

Connect with me :)

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